

**AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions, and listing, of claims in the application.

1           1.     (Original) A method for determining a position of an acoustic receiver,  
2 comprising:  
3           determining a plurality of acoustic ranges from at least a first signal source position and a  
4           second signal source position, respectively, to the acoustic receiver;  
5           ascertaining a non-acoustic constraint on the acoustic receiver's position; and  
6           determining the acoustic receiver's position from the first and second acoustic ranges and  
7           the non-acoustic constraint.

1           2.     (Original) The method of claim 1, wherein ascertaining the non-acoustic  
2 constraint includes one of sensing an angular orientation of the acoustic receiver, sensing a  
3 heading of the acoustic receiver, sensing a water depth of the acoustic receiver's position,  
4 retrieving an archived water depth measurement for the acoustic receiver's position, and  
5 retrieving a stored distance from a known second position to the acoustic receiver's position.

1           3.     (Currently Amended) The method of ~~any preceding claim 1 to claim 2~~, wherein  
2 determining the acoustic receiver's position from the acoustic ranges and the non-acoustic  
3 constraint includes:  
4           determining an intersection of a first sphere defined by the first signal source position, a  
5           second sphere defined by the second signal source position, and a plane defined  
6           by the non-acoustic constraint; and  
7           selecting one point of the intersection.

1           4.     (Original) The method of claim 3, wherein selecting the one point of the  
2 intersection includes one of determining the intersection of a third sphere defined by a third  
3 signal source position, determining a water depth at the acoustic receiver's position, and  
4 eliminating a second point of intersection as physically improbable.

1           5.       (Currently Amended) The method of ~~any preceding claim 1 to claim 2~~, wherein  
2 determining the position from the acoustic ranges and the non-acoustic constraint includes:

3               modeling the acoustic receiver's position from historical positions associated with the  
4               acoustic receiver's position; and  
5               applying a genetic algorithm to constrain the modeled position with the non-acoustic  
6               constraint.

1           6.       (Original) The method of claim 5, wherein applying the genetic algorithm  
2 includes applying a linear regression or a least squares fit.

1           7.       (Original) The method of claim 5, wherein the acoustic receiver's position is  
2 determined dynamically as the position changes over time through the historical positions.

1           8.       (Currently Amended) The method of ~~any preceding claim 1 to 6~~, wherein the  
2 acoustic receiver's position is determined dynamically as the position changes over time.

1           9.       (Currently Amended) The method of ~~any preceding claim 1 to 8~~, further  
2 comprising performing the method for a plurality of points.

1           10.      (Original) The method of claim 9, wherein the points are constrained to points on  
2 a cable.

1           11.      (Original) The method of claim 10, further comprising determining the shape of  
2 the cable from the determined positions.

1           12.      (Original) The method of claim 1, further comprising determining an acoustic  
2 range from a third signal source position.

1           13.      (Original) An apparatus, comprising:  
2               at least one acoustic source;  
3               an acoustic receiver capable of receiving a plurality of acoustic signals transmitted by the  
4               at least one acoustic source from at least two signal source positions; and

5 a computing system programmed to determine a position of the acoustic receiver from  
6 the acoustic ranges between the at least two signal source positions and the  
7 acoustic receiver and a non-acoustic constraint.

1 14. (Original) The apparatus of claim 13, wherein the at least one acoustic source  
2 comprises an airgun.

1 15. (Original) The apparatus of claim 13, further comprising a sensor located at the  
2 position of the acoustic receiver to sense the non-acoustic constraint.

1 16. (Original) The apparatus of claim 15, wherein the sensor is one of an angular  
2 orientation sensing device, a heading sensor, and a water depth sensor.

1 17. (Original) The apparatus of claim 15, wherein the sensor comprises one of means  
2 for sensing an angular orientation of the position, means for sensing a heading for the position,  
3 and means for sensing a water depth.

1 18. (Original) The apparatus of claim 13, wherein the computing system is further  
2 programmed to analytically determine the position.

1 19. (Original) The apparatus of claim 18, wherein the computing system is further  
2 programmed to, for the acoustic receiver's position:  
3 determine the intersection of a first sphere, a second sphere, and a plane, the first sphere  
4 and the second sphere being defined by the acoustic ranges and the plane being  
5 defined by the non-acoustic constraint; and  
6 select one point of the intersection.

1 20. (Original) The apparatus of claim 19, wherein the computing system is further  
2 programmed to impose the non-acoustic constraint in selecting the one point of the intersection.

1 21. (Original) The apparatus of claim 20, wherein the non-acoustic constraint is one  
2 of an angular orientation of the acoustic receiver, a third acoustic range from a third signal  
3 source to the acoustic receiver, a water depth measurement for the acoustic receiver's position,  
4 and a heading for the acoustic receiver.

1           22.    (Original) The apparatus of claim 18, wherein the computing system is further  
2 programmed to analytically determine the acoustic receiver's position dynamically as the  
3 position changes over time.

1           23.    (Original) The apparatus of claim 13, wherein the computing system is further  
2 programmed to, for the acoustic receiver's position:

3               model the acoustic receiver's position from historical positions associated with the  
4               position; and

5               apply a genetic algorithm to constrain the modeled position with the non-acoustic  
6               constraint.

1           24.    (Original) The apparatus of claim 23, wherein the computing system is further  
2 programmed to apply at least one of a linear regression and a least squares fit in applying the  
3 genetic algorithm.

1           25.    (Original) The apparatus of claim 23, wherein the acoustic receiver's position is  
2 determined as the position changes over time through the historical positions.

1           26.    (Original) The apparatus of claim 13, wherein the non-acoustic constraint is one  
2 of a third acoustic range from a third signal source position to the acoustic receiver, a water  
3 depth measurement for the acoustic receiver's position, an angular orientation of the acoustic  
4 receiver, and a heading for the acoustic receiver.

1           27.    (Original) The apparatus of claim 13, further comprising a cable on which the  
2 acoustic receiver is deployed.